THE IMPACT OF A PRECOLLEGE MINORITY INTERVENTION PROGRAM ON THE ACADEMIC PERFORMANCE OF AFRICAN AMERICAN STUDENTS AT A COMMUNITY COLLEGE

By

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Dedicated

to

the angels in my life:

my mother,
Rosalie Jones Evans;

my sons,
Andrew Ikechukwu Ezigbo and Joseph Oraefoh Ezigbo;

my husband and best friend,
Charles Ikechukwu Ezigbo;

and

my father-in-law,
the late Chief Francis Oraefoh Ezigbo

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THE IMPACT OF A PRECOLLEGE MINORITY INTERVENTION PROGRAM ON THE ACADEMIC PERFORMANCE OF AFRICAN AMERICAN STUDENTS AT A COMMUNITY COLLEGE

By

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This study compared the academic success of African American students who participated in a precollege minority intervention program with African American students who did not participate in the program. A community college in north central Florida, hereafter referred to as College A, served as the institution of record.

Study criteria required that students have a high school diploma or the general equivalency degree (GED) certificate. Only students who began as full-time students (registered for 12 or more credit hours) were included as subjects. The study focused on students who attended College A for a minimum of two consecutive semesters, following initial enrollment. All students were pursuing either (a) an Associate of Arts (AA) degree, (b) an Associate of Science (AS) degree, or (c) a program certificate.

A review of College A's mainframe database revealed 155 students who satisfied the criteria of the study. Forty-four of these 155 students had completed the precollege minority intervention program at College A; the remaining 111 students did not participate in the precollege minority intervention at College A. The two groups were identified as program and nonprogram students, respectively.

Of the success measures identified in the study, nonprogram students outperformed program students only in terms of overall GPA (GPA-ALL) and college credit GPA (GPA-AA). On all other success measures--graduation rate, CLAST pass rate, college math hours earned, retention rate, first semester hours earned, first year hours earned, hours earned overall--program students did as well as or better than the nonprogram students. African American students at College A appeared to benefit from participation in the precollege minority intervention program. Overall, the students who experienced the program intervention were as successful or more successful academically when compared with nonprogram students.

CHAPTER I
THE PROBLEM AND ITS SIGNIFICANCE

Background

Despite small gains, the number of minority students in higher education remains disproportionately low (Evangelauf, 1993). The Supreme Court passed the Higher Education Act of 1965 to mitigate the impediments of race and gender as barriers for American citizens seeking upward mobility and full economic participation through college and university enrollment. As a minority cohort, African Americans have made great strides; however, discord persists between the opportunity provided by the Higher Education Act and resulting educational achievements by African Americans. Overall, Americans are better educated than ever; however, when using the least indicator of a high school diploma, enrollments of minorities, specifically African Americans, in higher education are declining, and many African Americans who enroll are not graduating (Kemp, 1990; Shaw, 1991).

Bushnell (1991) found that stereotypes about performance abilities and teacher expectations can adversely affect educational achievements of African American students. He asserted that secondary school environments often "tracked out" these students from adequate college preparatory course work. The resulting inadequate preparatory background has the potential of creating a self-fulfilling prophecy of failure. Upon

graduation from high school, many African American students lack the skills needed for success in college.

Higher Education--A Forum for Diversity in a Changing Society

Looking toward the 21st century, Cortes (1991) described colleges and universities as uniquely positioned to address the diversity revolution in view of impending changes in population demographics. Colleges and universities can help to unify society within an academic arena; through college and university enrollment, students potentially encounter unlimited opportunities to interact with diverse groups, indicative of society overall (Daniels, 1991).

From a global perspective, the demand for increased education in American society has become a catalyst for increased growth, productivity, and expansion in the community college. Spurred on by a societal environment rich in increasing competitiveness and technological advancements, nontraditional students are returning in record numbers to the higher education arena. Atypical students, including women, racial minority groups, and immigrants, have engaged in an aggressive pursuit of upward mobility and societal matriculation through community college arenas.

The open door policy of the community college has allowed many returning students the opportunity to correct past educational deficiencies. The report, Building Communities: A Vision for a New Century (AACJC, 1988) recommended that

> community colleges must help to solve the dropout problem. If they do not, minority students will continue to leave school at the current rate, an increasing proportion of our citizens will face the prospects of social and economic failure, and communities will languish. . . . We recommend that the reading, writing, and computational ability of all first-time community

> college students be carefully assessed when they enroll. Those not well prepared should be placed in an intensive developmental education program. Community colleges must make a commitment, without apology, to help students overcome academic deficiencies and acquire the skills they need to become effective, independent learners. (pp. 9, 17)

Issues and Challenges Facing the Community College

Blumenstyk (1989) reported that standards of admission in higher education are increasing. He characterized admission standards as threats to minority participation in higher education. Lively (1993) also found that many four-year colleges and universities have tried to dissociate themselves from remedial course work in an age of an increasingly diversified student body. On the other hand, community colleges invariably offer opportunities for remediation. A problem arises, however, with respect to graduation. While students gain entry to the community college, concern persists over the number of students who actually graduate or complete degree requirements. Far too many students depart through the rear doors of the community college without a degree. While every student enrolling in a community college does not seek a two-year transfer degree, most students report that they do enroll for that purpose.

Collison (1991) found that concerns about the economy, escalating costs of four-year institutions, and caps on state college enrollments made many high school graduates look to community colleges, where completion of their freshman and sophomore years could occur at a fraction of the cost typically associated with a four-year school. Financial pressures, increasing enrollments, and needs for remedial education are common concerns for two-year community colleges. Jacobson (1993) reported that some

community college faculties felt that remedial programs were draining resources from other valuable areas of the curriculum. A groundswell of discontent has arisen among faculty regarding student readiness level and administrative expectations of faculty accountability (Mooney, 1989).

Statement of the Problem

Collison (1988) cited an American Association of Community and Junior Colleges study which addressed the potential impact on the nation of a continued underutilization of minority groups:

> The problem of the future will not be a labor shortage, but a skill shortage, born of the mismatch between the needs of the labor market and the profile of the labor pool. It is precisely as a result of this mismatch that a new nation will emerge within our borders--a darker nation born in poverty--out-of-school, out-of-skills, out-of-hope--unemployed and unemployable. (p. 32).

College and universities generally design intervention programs to identify potential "dropouts," monitor student progress, and help such students in matriculation. Pretesting and intervention programs are vitally important (Gordon & Grites, 1984; Jones, 1986; Zwerling, 1980). Rationale for evaluation of such programs or courses revolves around program purposes, criteria for evaluation, and indicators of program success. Evaluation injects an important system of checks and balances into assessment of program quality and institutional effectiveness.

Specific to the math, science, and technology pipeline, participation and achievement levels for African American students are exceptionally low (Anderson, 1990; Malcolm, 1990). Kantrowitz and Wingert (1991) reported a critical need for enhancement

of enrollment and completion rate in math or math-related disciplines of minority students, specifically African Americans.

Additionally, a student's precollege mathematics background may have a long-term effect on postsecondary study and career options (Cipra, 1989). Without intervention, countless African American students who have been shortchanged by their secondary school experiences, either voluntarily or involuntarily, will be unable to move forward in America's technologically competitive society. Projections are that these disenfranchised students will ultimately affect America negatively as a nation.

Statement of the Purpose

Colleges and universities need more programs to help African American students enter mainstream college course work and experience success in progress to degree completion (Kemp, 1990; Shom & Spooner, 1990). The purpose of this study was to determine if evidence existed showing that a precollege minority intervention program was associated with higher academic performance, retention, and success for African American students at a community college.

The initial sample in this study consisted of 44 African American students who completed the precollege intervention program. These students were first-time-in-college (FTIC) enrollees and enrolled in the Fall semester immediately after completion of the precollege minority intervention program. These program students were compared with a similar sample of 111 African American students who did not participate in the program. The study compared the two groups with respect to achievement in college level course work overall, achievement in college credit mathematics in particular, and college retention

and graduation rates. All students included in the study began their college matriculation as full-time Associate of Arts (AA) degree, Associate of Science (AS) degree, or certificate-seeking students.

This study addressed the issue of whether or not student enrollment in a minority intervention program was associated with academic performance, retention, and success, as measured by factors, including number of semester hours earned, grade point average (GPA), intended degree attainment, and student standing. The study also gave special emphasis to the number of hours earned by students in college level mathematics.

Analyses focused on the characterization and comparison of program and nonprogram minority students who enrolled for the first time as full-time students in terms from Fall 1985 through Fall 1989 at College A. These students reported that they planned to pursue either an AA, an AS degree, or a vocational certificate. The study tracked these students through the end of the 1995 Summer term.

Qualitative variables addressed in the study included classification (program or nonprogram), gender, enrollment status in mathematics, CLAST outcome, and student standing. Quantitative variables included entrance scores, number of semesters enrolled, first semester hours attempted, first semester hours earned, number of hours attempted in college level mathematics, number of hours earned in college level mathematics, number of hours earned in the first year of consecutive matriculation, GPA after one semester, GPA after one year, GPA overall, GPA in AA course work, total hours earned, credit hours per semester attempted, and credit per semester hours earned.

Specifically, this study compared program and nonprogram students by

1. Students' GPA

   --after one semester

   --after first year

   --in all course work

   --in college credit (AA) course work

2. Average number of

   --semester hours earned after one semester

   --semester hours earned after one year

   --semester hours successfully earned during college matriculation

   --semester hours in mathematics courses

3. Proportions of students passing the College Level Academic Skills Test (CLAST)

4. Proportions of retained students (graduated, enrolled in good standing [GPA $\geq$ 2.0], enrolled not good standing)

5. Proportions of successful students (graduated, enrolled in good standing, left in good standing).

Hypotheses

In comparing the academic performance, retention, and success of program students with that of nonprogram students, the following null hypotheses were examined at the .05 level:

Null Hypothesis 1: There is no significant difference in GPA after one semester of matriculation for program and nonprogram students.

Null Hypothesis 2: There is no significant difference in GPA after one year of matriculation for program and nonprogram students.

Null Hypothesis 3: There is no significant difference in overall GPA for program and nonprogram students.

Null Hypothesis 4: There is no significant difference in GPA in college credit course work for program and nonprogram students.

Null Hypothesis 5: There is no significant difference in the average number of semester hours successfully earned after one semester for program and nonprogram students.

Null Hypothesis 6: There is no significant difference in the average number of semester hours successfully earned after one year for program and nonprogram students.

Null Hypothesis 7: There is no significant difference in the average number of semester hours successfully earned during college matriculation for program and nonprogram students.

Null Hypothesis 8: There is no significant difference in the average number of semester hours successfully earned in college level mathematics for program and nonprogram students.

Null Hypothesis 9: There is no significant difference in the proportions (for college preparatory math entry level and mainstream math entry level) of students who pass the CLAST exam, when controlling for the student's classification for program and nonprogram students.

Null Hypothesis 10: There is no significant difference in the proportions of students who pass the CLAST exam, when controlling for the student's math entry level for program and nonprogram students.

Null Hypothesis 11: There is no significant difference in the proportions of students the college retained (graduated, enrolled in good standing [GPA $\geq$ 2.0], enrolled not in good standing) for program and nonprogram students.

Null Hypothesis 12: There is no significant difference in the proportions of students who are successful (graduated, enrolled in good standing, left in good standing) for program and nonprogram students.

Limitations of the Study

The following delimitations and limitations were present in this study:

1. Only students at a single community college were involved in the study; generalizations are therefore limited to institutions having similar profiles.

2. Subjects were limited to African American students (program and nonprogram) who were FTIC enrollees from Fall 1985 through Fall 1989 and who attended for at least two consecutive semesters following initial college enrollment.

3. Subjects were limited to African American students only.

Justification for the Research

Ackermann (1991) also reported that summer bridge programs or transitional programs for low-income and minority transfer students are becoming an established part of the effort to recruit, retain, and graduate a population of students underrepresented in higher education. Many at-risk students begin their college curriculum in the remedial track, especially in the areas of mathematics and English. Deficiencies in either area can preclude success in many college courses, even those that seem unrelated to these areas. Failure in mathematics can also be a limiting factor in an undergraduate's choice of major.

Unable to place into or successfully pass beginning level mathematics courses, the at-risk student may be forced to divert career plans. Thus, the lack of mathematics success may contribute to an at-risk student's decision to drop out of college (Berenson, Carter, & Norwood, 1992, p. 55). "Students themselves report that their experience in the discipline is their best indicator of continued success" (Wattenbarger & McLeod, 1989, p. 20). Retention and success reports involving minority student performance are valid accountability outcome measures for program evaluation and assessment of success in delivery of educational and intervention programs.

Definition of Terms

For the purposes of this research, the study defined the following terms:

Community college in this study refers to any two-year institution of public higher education which offers the AS degree, the AA degree, or both as terminal degrees.

MAT 0002, General Mathematics, is a component of the college preparatory mathematics curriculum at College A. The course has as a primary focus remediation of basic mathematics skills for grades 6 through 8 and is intended to enhance a student's success in further study of college level mathematics (Myers, 1988). This course carries no credit toward graduation.

MAT 0024, Elementary Algebra, is a component of the college preparatory mathematics curriculum at College A. The course has as a primary focus the provision of basic algebraic skills to students who lack secondary school study of algebra or who fail to achieve mainstream status in college level algebra as determined by placement scores on

one of several tests accepted by College A. This course carries no credit toward graduation.

MAC 1102 is used in this study to refer to College Algebra, the first course in the college-level mathematics curriculum at College A.

A minority student is used in this study to refer to an African American student.

Mainstream student is used in this study to refer to a first-year student who has "tested out" of the precollege curriculum (college-preparatory classes) by virtue of scores attained on one of several standardized exams or placement tests accepted by the college.

College preparatory (college prep) is used in this study to refer to precollege course work that does not count as degree credit; college prep course work must be taken and passed before a student can register for college credit course work.

CPT is used in this study as an acronym for the "Computerized Placement Test." The CPT consists of a database of questions in the areas of reading, writing, arithmetic, and algebra skills. Students entering the community college may take the CPT in order to assess the most appropriate entry point in the college curriculum.

The abbreviation, SAT, is used in this study as an acronym for the "Scholastic Aptitude Test." The SAT is a standardized exam whose scores are used to assess student placement within the college curriculum or admission into some American colleges and universities. Comprised of two portions, mathematics and verbal, each section has a maximum score of 800; overall the examination has a maximum score of 1,600. The College Board administers the test (Sun News Services, 1991).

<u>ACT</u> is used in this study as an acronym for the assessment instrument of the American College Testing Program, which measures proficiency in English, mathematics, social studies, and natural sciences. The test is scored on a scale of 1 to 36.

<u>Good standing</u> is used in this study to refer to any student who has a grade point average (GPA) ≥ 2.0.

<u>A student outcome</u> is used in this study to refer to factors including, but not limited to. graduation rates, grade point average, CLAST result, and attrition rate.

<u>A successful student</u> is used in this study to refer to any student who graduated, was enrolled in good standing, or left in good standing after four years from the date of initial enrollment.

<u>A retained student</u> is used in this study to refer to any student who graduated, was enrolled in good standing, or was enrolled, not in good standing, after four years.

The <u>CLAST exam</u> is used in this study as an acronym for the "College Level Academic Skills Test," an exam required of all students seeking receipt of the AA degree or upper division study in a four-year Florida institution.

Summary

This study focused on the academic performance, retention, and success of full-time FTIC African American students at a community college. The association between success in college level study and a precollege academic intervention program was of primary interest. The research sought to answer the following question: Do African American students who complete a precollege academic intervention program do as well as or better than African American students who do not complete the program at a

community college? This study adopted the premise that successful completion of prerequisite course work in mathematics is essential to the completion of certain degree programs. Consequently, this study also examined the success of African American students in college level mathematics course work at a community college by calculating the hours earned in mathematics.

Chapter II reviews the literature on the need for remedial programs and program evaluation in higher education, the role of the community college in the access and transfer process, African American participation in higher education, and the importance of mathematics. Chapter III details the statistical methodology used in the study. Chapter IV presents the results of the data analyses. Finally, Chapter V gives the summary of the study and recommendations for further research.

CHAPTER II
REVIEW OF LITERATURE

Retention Programs and Program Evaluation

While many colleges and universities have programs in place to help student retention, not enough institutions provide formative and summative assessments of program effectiveness with respect to established goals. Grunder (1996) identified program evaluation and assessment as critical components that are often missing in many orientation courses and programs designed to help retain community college students. Roueche and Roueche (1993) identified "emerging incentives" for program evaluation based largely on public and legislative pressure for institutions to validate program effectiveness. Roueche and Roueche also argued those evaluation processes such as minimum competency testing, outcome assessment, exit criteria for students, and statistical documentation of program effectiveness are taking on increasingly significant roles (pp. 195-202).

Many colleges have been forced to start program evaluation of retention programs in response to challenges brought on by shrinking budgets, performance-based funding, and the need for greater program accountability about institutional effectiveness. Oliver (1993) noted improvements in retention rates from fall-to-fall and first-to-second term at Midlands Technical College for students who participated in the college's comprehensive

student success program. Fink and Carrasquillo (1994) reported higher success rates for students using the PLACE tutorial center at Miramar College in San Diego, California; Pantano (1994) provided program evaluation results that showed that a summer bridge program at Santa Fe Community College, New Mexico, was effective in encouraging students to take science and math courses and preparing them to succeed in college level course work. Grevatt (1992) reported that the Student Success Program (SSP) at Mohawk College of Applied Arts and Technology, in Ontario (Canada) significantly reduced student attrition in at least six program areas. Isonio (1993) conducted a study at Golden West College in California and found that student participation in the college's assessment or orientation program was consistently associated with higher persistence rates than was participation in neither component.

Access in the Community College

Major technological advancements, and a subsequent need for highly skilled workers, have contributed to a diverse student population in higher education. Categorically, women, racial minorities, and immigrants have engaged in an aggressive pursuit of upward mobility through the avenues provided by the community college. Thus, in an age of open access, community college faculty find themselves faced with many college students who are ill-prepared to go further in study without basic remediation.

Besides the influx of returning and nontraditional students, contemporary high school graduates are leaving secondary school with multiple content and knowledge deficiencies, especially in mathematics. Current reform movements include increased

admission standards as a means of preserving educational standards and fostering excellence in higher education. By default, universities which subscribe to the Darwinian theory of "natural selection" and survival of the fittest continue to exclude many individuals from an educational opportunity to redeem themselves.

Cohen (1987) found that maintaining access for all students was a major area of concern in the community college. He noted, however, that even in the community college trends toward tightening criteria for attendance have become increasingly common. Society's demand for more education continues to manifest itself as a catalytic agent for change within the community college. A paradoxical constant within the community college is its self-imposed mandate to continually adapt to meet the needs of the current student population All indications are that the flexible nature of the community college preparatory curriculum must persist to effectively address the changing student population, the idea of the "open door" admission policy, and the move toward access with excellence (Donovan, 1985; Edwards, 1987; Rice, 1985: Roueche, Baker, & Roueche, 1985).

Attrition and the Transfer Function

Platt (1986) offered five reasons why community colleges must continue offering remedial course work as part of the standard college curriculum: student needs, unwilling victims of reform (the excellence "elitist" movement), adult students' needs, student outcomes (subsequent degree completion), and the morality of the issue. Remediation in college is a definite necessity; with greater shifts in student demographics, the community college curriculum will continue to be affected. Attrition remains a significant problem in

the community college, irrespective of student demographics. "Keeping" students is at least as important as "attracting" them (Zwerling, 1980, p. 58). Realistically, a complete eradication of attrition is improbable; however, continual efforts to reduce the span of revolution of the "revolving door" are imperative, so that most students, especially minorities, exit higher education institutions with a degree in hand. Attrition is not necessarily a function of academics alone. Student mentoring, counseling, and guidance throughout the educational process seem significant factors in reduction of high dropout rates in higher education (Cage, 1990,1991; Fields 1987). Key factors in reducing attrition rates include identification of potential "dropouts," monitoring student progress, and providing counseling and tutorial services for students.

Precollege intervention programs are crucial to the success of disadvantaged students so that these students can realistically pursue college level study (Hirschorn, 1987). Richardson and Bender (1987) reported that community colleges should involve university and community college faculty in summer transitional programs that provide opportunities for minority students to strengthen academic skills. Grunder (1996) found that African American students who were enrolled in a College Success Course had a lower attrition rate than students not participating in any aspect of the College Success Program. She also found that African American students who were only enrolled in the College Success Course had a higher grade point average than students participating only in Orientation and students not participating in any aspect of the College Success Program. Roderick (1993) cited Tinto's theory that "students who have trouble early in their academic study may be more likely to conclude that they do not fit into the social

and intellectual life of the community" (p. 91). Early intervention programs may help to alleviate problems associated with academic difficulty and by that can empower students to progress effectively toward degree completion or goal attainment.

Grubb (1991) referred to national longitudinal studies that concluded that transfer rates from community colleges to universities have declined substantially for all student groups. Clowes and Levin (1989) asserted that the academic transfer program at the community college is decaying quickly, falling victim to an increased emphasis on skill orientation. Armstrong (1993) emphasized the role of indicators of transfer effectiveness in community college accountability efforts. Preparing students for upper division study in nonvocational fields should persist as a primary mission of the community college. Increased emphasis on keeping minority students in college until they graduate or transfer is a national imperative, as too many colleges and universities recruit students only to drop out before degree completion or transfer. Efforts to increase high school graduation rates, raise college-going rates, increase graduation rates of college students, and raise transfer rates of community college students are urgent for minority students (Cage, 1989).

Burd (1992) discussed proposed regulations that would require institutions of higher education to show graduation rates of full-time degree or certificate-seeking undergraduate students. Greene (1987) reported that institutions are taking steps through first-year orientation to challenge students before they start classes, so that they can get a more representative portrait of the rigor of college life. Watkins (1990) cited

improvement in teaching, expanded educational opportunities, and increased community participation as influencing factors in reducing the dropout rate.

The Role of the Community College in the Transfer Process

Historically, the community college has been an institution where poorly prepared, historically disadvantaged, and minority students have migrated. Hsiao (1992) wrote,

> As a college degree becomes increasingly important for individuals seeking employment, the number of first-generation students continues to grow. With the first-generation student pool comprised largely of members of . . . ethnic minorities, women, and adults, community colleges have always viewed first-generation students as a primary clientele . . . First-generation students . . . face a daunting array of challenges in their pursuit of postsecondary education. In order for this high-risk group to succeed in their academic endeavors, colleges must provide a range of programs and services to counteract the weaknesses many of them bring to higher education. (p. 3)

Mercer (1992) highlighted the increasing frequency with which students are enrolling in community colleges as a less expensive, more accessible route to the bachelor's degree. By default, representatives of state legislatures have been forced to recognize the community college's invaluable role as a result of tight budgets and overcrowding. Watkins (1989, 1990) admonished community colleges for failing to place sufficient emphasis on academics, in deference to an overemphasis on occupational education. Such a reduction in emphasis on transfer programs inevitably impedes the academic progression of the two-year community college student by establishing barriers that prohibit subsequent transfer to four-year institutions.

Watkins (1989) cited a report estimating 15% to 25% of community college students transfer to four-year institutions; a definite need persists for community colleges to focus on liberal arts programs as a top priority in increasing the number of minority student transfers. Watkins (1990) also reported that community colleges were being pressed to eliminate barriers that keep many students, especially minority students, from transferring to four-year institutions.

Minority Participation in Higher Education

Rendon and Mathews (1989) warned that the greatest losses of minority students are occurring as students pass through two points in the educational pipeline: (1) the precollege level and (2) the community college level. Rendon and Mathews reported that many minority students are leaking out of the educational pipeline at the precollege level, and of those who do make it to college, a disproportionate number enroll in community colleges where another rupture in the pipeline occurs. Thus, understanding what is happening to minorities is important at these two critical points in the educational pipeline.

Kaliszeski (1987) identified a statistically significant relationship between race and cooling out process when examining student completion and graduation rates in community college programs. "The cooling out process was defined as a set of counseling strategies designed to assist students with unrealistic aspirations in selecting alternative career goals which would be more in line with their abilities" (p. xii). For the purposes of his study, Kaliszeski defined the cooling out process as having the following set of procedures:

1. Preentrance placement testing and/or advising.
2. Mandatory or voluntary placement into one or more developmental courses in areas such as mathematics, English, reading or study skills.
3. Placement on academic warning and/or probation.
4. Complete withdrawal form the institution (dropping out) or, achieving graduate status by changing initial major to an alternative program of study which is perceived by the student as being less rigorous and/or associated with less status. (p. 8)

Summers (1990) found in Florida that African Americans represented 18.7% of the 15- to 24-year olds in 1988, but they earned only 4.8% of the associate degrees awarded by community colleges and 4% of the baccalaureate degrees awarded by the State University System that year. An initial strategy that Summers advocated for promoting minority student college attendance, graduation, and transfer was to identify academically promising students in middle school and guide them toward preparation for college. Fuhrmann, Armour, and Wergin (1991) identified African American males in college as an endangered species. Green (1989) reported that shortages of minority doctorates in science, mathematics, and engineering are acute. A major problem facing graduate education today is decreasing enrollments for African American students.

The Relative Importance of Mathematics

The relative importance of mathematics in college matriculation is readily substantiated by a cursory glance at any college or university catalog general education requirements. Such a pervasiveness of mandatory math course work across varying disciplines provides the impetus for examining minority student academic performance and success in college level mathematics. Concern continues over the performance of African Americans and other minorities in math and sciences.

The importance of mathematics in secondary and postsecondary education is further addressed in a U.S. Department of Education study which concludes, "There is a positive correlation between the number of mathematics courses a person takes and earnings in the first decade of employment. . . . Not surprisingly, students who took more mathematics in high school or college earned substantially more than others" (Cipra, 1989, p. 314). Kaufmann (1990) looked at the relationship between postsecondary and high school course-taking patterns. He found that the types of courses students took in high school corresponded to the types of courses they took in postsecondary education. Results of Kaufmann's research indicated that female students had less intensive high school mathematics preparation than did male students; also, African American and Hispanic students completed high school mathematics and science courses at relatively low rates.

Without a doubt, the achievement of U.S. students in mathematics and science before, during, and after college enrollment leaves much room for improvement. Student performance on achievement tests, specifically in mathematics, continues to be distressingly low in a discipline virtually indispensable in view of its widespread applicability. According to Hammond (1990), American students--regardless of race or gender--continue to rank at the bottom of the list, when compared with other international students about mathematical and scientific ability.

The utility of mathematics in business and industry, scientific advances, and national defense has remained a constant since the era of Sputnik; however, student

enrollments in mathematics or related disciplines, along with new teacher graduates, have continued to decline (Gibbons, 1990; Kantrowitz & Wingert, 1991; Useem, 1991).

In general, secondary students do not take enough mathematics and science courses in preparation for college study. When controlling for race, widely reported statistics indicate that minority students are even less prepared for college study in mathematics and science.

Summary

A review of the literature clearly indicates a perceived need for programs which seek to enhance participation and persistence rates of all minority groups in higher education. The open door policy of the community college continues to encourage participation of minority students in higher education. Community colleges provide ideal environments for establishing and evaluating intervention programs which are designed to help minority students experience successful college matriculation, progress-to-degree completion, and upper division study. Finally, the mathematics requirement for many college majors and subsequent career choices provides justification for assessment of student success in college level course work in mathematics.

CHAPTER III
METHODOLOGY

Introduction

A study was conducted at College A, a community college in Florida, to determine if evidence existed showing that participation in a precollege minority intervention program was associated with higher academic performance, retention, and success for African American students at a community college. The precollege minority intervention program was designed to aid minority students in meeting college entrance requirements, while simultaneously enhancing their persistence rate until graduation. This minority intervention program provided precollege level instruction in reading, English, and mathematics. The program also provided instruction in "college survival skills" including study skills, note-taking skills, test-taking skills, and career decision-making skills.

One sample for the study consisted of African Americans who became first-time-in-college (FTIC) students at College A in the Fall semester immediately following program completion during the 1985-1989 academic years. The study investigated a second sample of African Americans, who were FTIC students at College A, during 1985-1989 but did not participate in the minority intervention program. The criteria of the study required that a student have a high school diploma or the general equivalency

degree (GED) certificate. Only full-time students (registered for 12 or more credit hours in the first semester) were included. Only students who attended College A for at least two consecutive semesters, commencing with initial enrollment, were included in the study. Also, only students who showed that their goal was to complete an Associate of Arts (AA) degree, an Associate of Science (AS) degree, or a program certificate were included. The criteria prohibited inclusion for both groups if a student had any previous college credits. Both samples were restricted to students whose entrance exam test scores were on file. Concordance tables between the ACT, SAT, and CPT entrance exams were used to equate student entrance scores on different tests for subsequent comparisons.

Examination of the college's mainframe database revealed a study sample of 155 African American students who fit these criteria. The program cohort consisted of $\underline{N}$=44 students; the nonprogram cohort consisted of $\underline{N}$=111 students. To balance the comparison of these two nonrandom samples, the entry-level test score for ACT-Math or its transformed equivalent was used as a covariate in the analysis, as the program students had higher average entrance scores.

A comprehensive database file was built based on a review of the mainframe transcripts of targeted students. Variables identified included program classification, gender, program code, hours earned, grade point average (GPA), scores on entrance exams, math entrance level, college math attempted, college math earned, first semester average, first year average, first semester hours earned, first year hours earned, CLAST status, and standing. All students considered for the purposes of this study were African American and of traditional college age (18-22) upon FTIC enrollment. The precollege minority

intervention program targeted high school graduates within one year of graduation date. For parity in comparisons, students of nontraditional age upon FTIC enrollment were immediately deleted from inclusion in the study for the nonprogram students. The two groups, program and nonprogram full-time FTIC students, from Fall 1985 to Fall 1989, were tracked over the period Fall 1985 to Summer 1995 in order to summarize academic performance, retention, and success rates. The study analyzed historical data to determine whether sufficient evidence existed to support the hypotheses of no significant difference in academic performance for program and nonprogram students. The two groups were compared on the basis of grade point average, number of semester hours earned, CLAST result, and student standing.

College A's Precollege Minority Intervention Program

The Office of Ethnic Diversity at College A has as a primary focus the implementation of programs and services which assist the minority student in college matriculation. Currently, the Office of Ethnic Diversity at College A consists of one full-time administrator, the Director of the Office of Ethnic Diversity, a full-time professional specialist, who coordinates minority student retention and tutoring efforts, and a full-time executive secretary.

In addition to its 12-month staff, the Office of Ethnic Diversity engages five to six instructors for the Summer term of each school year; this instructional contingent provides precollege level instruction in the areas of reading, English, and mathematics through its precollege minority intervention program. Instruction is also provided in "college survival skills" which include, but are not limited to, the following: study skills,

note-taking skills, test-taking skills, and career decision-making skills. Generally, the instructional staff is comprised of College A instructors or high school teachers from the area. Also specific to College A's precollege minority intervention program is the supplemental staff which consists of two part-time minority student recruiters and one part-time on-campus student employment supervisor.

Goals of the Precollege Minority Intervention Program

The mission statement of College A lists commitment to access and success for all students. In 1984, College A authorized the establishment of a precollege minority intervention program known as PREP under the supervision of the Office of Ethnic Diversity (formerly known as the Minority Affairs Office). The PREP program was established to help recruit, retain, and graduate minority students. Cherry-Clark (1987) documented the program purpose as follows:

> A 1983 analyses of first-time-in-college (FTIC) Black students at College A revealed that these students were entering the college but were neither graduating nor successfully completing their educational goals. In recognizing this problem of recruiting and retaining Black students, College A allocated staff and economic resources to examine and correct the problem. The Minority Affairs Office, under the direction of the Student Development Office, was reorganized to define, coordinate, and implement services for the Black student population. Throughout the College, support services and programs were developed into a network of support systems for Black students in an effort to enhance their persistence and retention. (p. 1)

Currently, the precollege minority intervention program operates as a postsecondary academic intervention program designed to assist the 'high-risk' traditional college-age African American student. The program is a six-week academic enrichment

summer program designed to provide selected minority high school graduates with the necessary instruction to meet college entrance requirements and enhance persistence until graduation. The program primarily serves African American students who will be enrolling at College A in the transfer Associate of Arts programs (AA) or Associate of Science two-year programs (AS) in the fall term immediately following program completion.

The goals of the precollege minority intervention program at College A were designed to reflect compliance with the overall college mission statement. Official literature of the Office of Ethnic Diversity lists the following as goals of the precollege minority intervention program:

1. To promote quality precollege instruction.

2. To promote a level of student service necessary to support and encourage the success of (minority) students in higher education.

3. To improve a student's analytical, writing, reading, mathematical and oral communication skills.

4. To promote the subsequent admission of academically qualified [minority] students.

5. To help students assess their academic or vocational opportunities.

6. To promote a smoother transition for (minority) high school graduates into college.

7. To provide on-campus employment or (access through) scholarship opportunities.

The College Preparatory Curriculum in Mathematics at College A

Toward promoting access and success, the Mathematics Department of College A has historically listed the following among its planning unit goals:

1. To prepare inadequately prepared students with the basic skills needed to attempt college level work in mathematics.

2. To prepare students for upper division study in disciplines that are dependent upon mathematics.

3. To modify and expand the curriculum offerings in mathematics to meet the changing needs of the student and society.

At the time of the study, the college preparatory curriculum for the Mathematics Department at College A consisted of MAT 0002 and MAT 0024, General Mathematics and Elementary Algebra, respectively. The primary focus of General Mathematics was to provide instruction in basic arithmetic skills for middle school grades and to enhance student success in further study of college level mathematics; the primary focus of Elementary Algebra was to provide basic algebraic skills to students who lacked secondary school study of algebra or who failed to achieve mainstream status in college level algebra as determined by placement scores.

In the instructional category of College Preparatory Mathematics, historical student enrollment data in the Department of Mathematics course work at College A for 1990-1991 showed a disproportionately high number of minorities for three (3) protected classes, specifically African Americans, Hispanics, and women. For FTIC students in the AA and AS track, combined enrollment data in college-preparatory mathematics courses,

specifically MAT 0002 and MAT 0024, revealed evidence of a disproportionate number of minority (African American, Hispanic, female) students. Observed minority enrollment in college preparatory mathematics courses was more than two standard deviations above the expected average enrollment. By contrast, however, the observed proportions for "other minorities," "white," and "male" FTIC students each reflected underrepresentation of these cohorts in the college preparatory track. These historical college data also highlight the relevance of examining the progression of minority students, especially African Americans, from the college preparatory curriculum to college level study in mathematics.

Description of the Subjects

African American students who enrolled in and completed a precollege minority intervention program from Fall 1985 to Fall 1989 served as primary source data for this study. The study was restricted to full-time AA, AS degree seekers, or program certificate seekers as indicated on students' mainframe historical records. Sample inclusion was also limited to those students whose first time in college was the immediate Fall semester after program participation.

The initial sample of program students was formed from the total population of African American students who participated in a summer session of the precollege minority intervention program from 1985-1989. This population had a size of $\underline{N}$=167. Students had to have attended at least two consecutive semesters (following initial enrollment) and have entrance exam scores on file. This nonrandom sample consisted of $\underline{N}$=44 subjects. From College A's database of minority students for Fall 1985 through

Fall 1989, a second group of African American students was identified. The nonrandom sample of program students consisted of N=111 degree-seeking or certificate-seeking students who did not experience program intervention but were full-time students, between 18-22, and who had ACT, SAT, or CPT entrance test scores on file. The ACT-Math entrance score was used as a covariate in the data analyses to adjust for the presence of higher average entrance scores for the program students.

Agresti and Agresti (1979) described covariance analyses as follows:

> Covariance analyses are especially useful when we wish to compare several groups (treated as levels of a categorical variable) on some interval dependent variable Y, while simultaneously controlling for an interval variable, which is referred to as the **covariate** . . . in comparing grade point average by [a categorical variable] for students completing their first year in a particular university, it might be important to control for their college entrance exam scores. . . . If the covariate is correlated with Y and has different distributions in the various groups, then the results of the covariance analysis will differ from the results of the analysis of variance procedure, in which the covariate is ignored (rather than controlled). (p. 458)

Student records were reviewed in an ex post facto design from Fall 1985 through the Summer of 1995. Highlights of the data analyses included the comparison of student persistence (hours earned) and academic performance (GPA) after one semester, one year, and during overall matriculation. The success rate (graduation, enrolled in good standing, or left in good standing) for the N=44 students who enrolled in the precollege minority intervention program was compared to that of the N=111 African American students who satisfied the criteria of the study but who did not experience program intervention.

Collection of the Data

From the historical records of the Office of Ethnic Diversity, African American students who completed the precollege minority intervention program during a summer session from 1985 through 1989 were identified. Only those satisfying the preestablished criteria of the study were included. The data collection involved identification of a similar group of nonprogram participants from the college's mainframe database. Once the samples were formed, the College A transcripts of these two groups of students were assembled and analyzed to determine hours earned, GPA, CLAST result, and student standing. All semesters, including Fall, Winter (Spring), and Summer, from Fall of 1985 through Summer of 1995 were included in the transcript review process.

Analysis of the Data/Research Expectations

The statistical software program, *SAS,* was used to generate frequency distributions and calculate means and standard errors for all quantitative variables. Additional *SAS* statistical procedures including Analysis of Variance (ANOVA) and Analysis of Covariance (ANCOVA) were used to test for significant differences between the two groups about GPA and credit hours earned. The *SAS procedure* PROC GLM was used to generate the ANOVA and ANCOVA tables. The logistic procedure was used for data analyses of possible significant differences in the CLAST success rates for program and nonprogram students. The ANCOVA analyses treated the entrance exam score in mathematics as a covariate. The statistical level of significance for all hypotheses was based on observed significance levels (p-values) $\leq .05$.

Dependent variables considered included number of semester hours earned, GPA-ALL (overall GPA), GPA-AA (GPA in college credit course work), CLAST status, college math earned, first semester average, first year average, first semester hours earned, first year hours earned, and student standing. Independent variables in this study included degree objective (AA, AS, Certificate); gender (male or female); placement in mathematics (college preparatory or mainstream); classification (program or nonprogram student), CLAST success (passed or had not passed).

The logistic procedure was used to examine various associations and interaction patterns in 2X2 contingency tables for the categorical variables in this study. The two groups were evaluated as to CLAST success, controlling for classification and math-entry level. Odds ratios were determined as well as confidence interval estimates on the odds ratios. Given a 2x2 contingency table, the odds (likelihood) of making a particular response, say B, may be defined as the ratio of the probability of making that response to the probability of not making that response. The odds ratio, also known as the cross products ratio, is the ratio or quotient of the odds values for two different groups. If the odds ratio is greater than 1, then group 2 has a higher likelihood of making response B than group 1; if the odds ratio is less than 1, then group 1 has the higher likelihood of making response B. If the odds ratio is equal to 1, then the odds of making response B is independent of the group under consideration.

The study academically tracked the two groups of students until they completed their academic careers at College A or through the Summer of 1995, whichever came first. This study provided a comparative analysis of retention and success rates for program

and nonprogram students. The retention measure showed the number and percent of students who graduated or were enrolled. The success measure indicated the number and percent of students who had graduated, were still enrolled in good standing, or who left in good standing.

Summary

This study evaluated the association between participation in a precollege minority intervention program offered at College A and African American student retention and success. The focus of the study was a comparison of a group of African American students who experienced precollege program intervention to a comparable group of African American students who did not experience program intervention.

To demonstrate program success and effectiveness, it was expected that program students should perform at or above the level of nonprogram students in terms of credits earned, GPA, CLAST success, graduation and retention rates.

CHAPTER IV
RESULTS

Introduction

The purpose of this study was to determine if evidence existed showing that participation in a six-week precollege minority intervention program was associated with the academic performance and success of African American students at a community college in Florida. Two groups were compared. One group consisted of African American students who had experienced program intervention; the second group of students had not experienced program intervention. The study compared groups by GPA, hours earned, hours earned in college level mathematics, proportions retained, and proportions successful. A total of N=155 African American students were identified who fit the criteria established for inclusion in this study. The sample for the program cohort consisted of N=44 students; the nonprogram cohort consisted of N=111 students. This chapter presents an analysis of the data which were collected to answer the research question. The chapter is organized by the following subtopics: (a) descriptive characterization of the total group, (b) tests of hypotheses, (c) other related findings, and (d) summary of Chapter IV.

Descriptive Characterization of the Total Group

Classification and Gender

Of the 155 students included in the study, 36.13% were male and 63.87% were female. Considering only male students, 16.07% were program students while 83.93% did not experience program intervention. Female students showed a distribution with 35.35% and 64.65% for program and nonprogram, respectively. Table 1 reflects the frequencies and percentages for subject classification as a program or nonprogram student on the basis of gender.

Table 1

Frequency Distribution: Classification by Gender

	Gender				
Classification	Male		Female		Total
Program	9	(16.07)	35	(35.35)	44
Nonprogram	47	(83.93)	64	(64.65)	111
Total	56	(100.00)	99	(100.00)	N =155

Note. Values presented are frequency counts. Numbers in parentheses indicate column percentages.

Classification and Entry Level Placement Scores

For the total group of 155 subjects, the average ACT-English score was 14.08; the average ACT-Mathematics score was 11.74; and the average ACT-Composite score was

13.58. Table 2 provides summary information about the average ACT-Math and ACT-composite scores for program and nonprogram subjects. Means and standard errors are provided in the table. The table revealed that entrance exam scores were higher on average for the program students in the area of mathematics. As a result, and due to the interest in the hours earned in college level mathematics, the ACT-Math score was used as a covariate in subsequent analyses. The ACT-Composite score was deleted completely from further analysis to minimize confounding with the ACT-Math score. Any model including the ACT-Composite score alongside the ACT-Math score was presumed to be an ill-conditioned model.

Table 2

Frequency Distribution: Classification by Average ACT Math Score

Classification		ACT Scores			
		ACT-Math		ACT-Composite*	
		M	SE	M	SE
Program	N=44	14	.12	16	.09
Nonprogram	N=111	11	.06	13	.04

Note. Scores are rounded to the nearest whole number.
*The ACT-Composite score was deleted from further analyses due to possible confounding with the ACT-Math score.

Classification and Mathematics Entry Level

Overall, for the total group of 155 subjects, 106 (68%) of the African American students began in the college preparatory mathematics track, while 49 (32%) were able initially to register for a college mathematics course. When controlling for program classification, Table 3 shows that 18 (41%) of the program students began in the college preparatory track in mathematics, unable to register for a college level mathematics course. The frequency table revealed that 26 (59%) of the program students began their college matriculation able to register for college level mathematics course work. By comparison, 88 (79%) of the nonprogram students began in the college preparatory track in mathematics; for these students 23 (21%) began their college matriculation able to

Table 3

Frequency Distribution: Classification by Mathematics Entrance Level

	Mathematics Entrance Level				
Classification	College Preparatory Math		College Level Math		Total
Program	18	(16.98)	26	(53.06)	44
Nonprogram	88	(83.02)	23	(46.94)	111
Total	106	(100.00)	49	(100.00)	155

Note. Values presented are frequency counts. Numbers in parentheses indicate column percentages.

register for college level mathematics course work. Table 3 presents a frequency distribution of math entry level and program classification.

Student Goal/Objectives

Of the 155 students included in the study, 125 (80.6%) declared the AA degree as their intended goal or objective of community college enrollment; 16(10.4%) declared the AS degree as their goal; and 14(8.4%) indicated a vocational certificate was the goal. Of the 106 (N=106) subjects who were required to take remedial math, the summary statistics were 83 (78. 3%), 12 (11.3%), and 11(10.4%), respectively. Of the 49 students who were able to register for college level math course work upon enrollment, 42(85.7%), 4 (8.2%), and 3 (6.1%), declared their goal as AA, AS, and certificate, respectively.

Table 4 shows that the majority of program students, 40 (90%), declared the goal of an AA transfer degree; 2 (5%) of the program students declared either the AS degree or a vocational certificate as the goal or objective of enrollment at College A. For nonprogram students, 85 (77%) declared the AA transfer degree as their goal; 14(13%) declared the AS degree as the goal; 12 (10%) declared a program certificate as the goal of community college enrollment.

Table 5 presents the means, standard errors, and the ranges for the total group (N=155) of subjects. On average, the study group earned nearly 60 credit hours overall and successfully completed an average of 49 hours of college credit course work. These students attended the community college for an average of approximately 7 semesters or roughly 3.5 years. The overall mean GPA was 2.42, with the average GPA for college credit work being almost identical at 2.40. This group of African American students

Table 4

Frequency Distribution: Classification by Goal

	Intended Goal or Objective						
Classification	AA degree		AS degree		Certificate		Total
Program	40	(32.00)	2	(12.5)	2	(14.00)	44
Nonprogram	85	(68.00)	14	(87.5)	12	(86.00)	111
Total	12	(100.00)	16	(100.00)	14	(100.00)	155

Note. Values presented are frequency counts. Numbers in parentheses indicate column percentages.

attempted an average of approximately 8.7 hours of college level mathematics and earned an average of approximately 5.53 hours. A visual inspection of the transcripts revealed that the students typically completed two courses in college level mathematics, as most did not enter courses such as Calculus which has a value of 5 credit hours.

Table 6 presents summary statistics based upon program classification in terms of each of the quantitative variables included in the study. Nonprogram students attained higher overall GPAs and GPAs in college level course work than their program counterparts.

Table 6 also shows persistence data for program students and nonprogram students. The fall, spring, and the 12-week summer terms were counted as one semester, while the six-week summer sessions were counted as one-half of a semester.

Table 5

Means, Standard Errors and Ranges for All Subjects (N=155)

Variable	M	SE	Range
Hours Attempted	64.65	2.30	15.00-167.00
Hours Earned	59.55	2.41	0.00-167.00
GPA-All	2.42	.05	0.00-3.74
GPA-AA	2.40	.06	0.00-4.00
Hours AA	48.91	2.21	0.00-115.00
Prep Math Attempted	5.73	.41	0.00-23.00
Prep Math Earned	4.03	.30	0.00-19.00
College Math Attempted	8.70	.57	0.00-27.00
College Math Earned	5.53	.41	0.00-23.00
# of Semesters Attended	6.81	.28	2.00-19.00
First Semester Hours Attempt	13.66	.16	10.00-21.00
First Semester Hours Earned	12.65	.17	0.00-18.00
First Year Hours Attempted	30.85	.55	15.00-53.00
First Year Hours Earned	24.72	.60	0.00-42.00
First Semester Average	2.65	.06	0.00-4.00
First Year Average	2.11	.07	0.00-3.80
Credit Per Semester Attempted	9.94	.20	3.73-18.00
Credit Per Semester Earned	8.81	.22	0.00-14.91

Table 6

Means, Standard Errors, and Ranges for All Subjects (N = 155) Based Upon Program Classification

	Program (N=44), Nonprogram (N=111)		
Variable	M	SE	Range
# of Semesters Attended			
Program	7.60	0.07	2.00-15.50
Nonprogram	6.50	0.03	2.00-19.00
First Semester Hours Attempted			
Program	12.80	0.02	10.00-16.00
Nonprogram	14.00	0.02	12.00-21.00
First Semester Hours Earned			
Program	12.70	0.03	9.00-16.00
Nonprogram	12.65	0.02	0.00-18.00
College Math Attempted			
Program	11.95	0.14	0.00-27.00
Nonprogram	7.41	0.06	0.00-26.00
College Math Earned			
Program	7.84	0.12	0.00-23.00
Nonprogram	4.61	0.04	0.00-19.00
First Year Hours Earned			
Program	23.93	0.14	0.00-38.00
Nonprogram	25.03	0.07	0.00-42.00
First Semester Average			
Program	2.72	0.01	0.57-3.19
Nonprogram	2.62	0.01	0.00-4.00

Table 6--continued.

	Program (N=44), Nonprogram (N=111)		
Variable	M	SE	Range
First Year Average			
Program	2.22	0.02	0.00-3.70
Nonprogram	2.07	0.01	0.00-3.80
GPA-All			
Program	2.39	0.01	0.00-3.19
Nonprogram	2.43	0.01	0.00-3.74
GPA-AA			
Program	2.33	0.01	0.57-3.19
Nonprogram	2.43	0.01	0.00-4.00
Hours Earned			
Program	61.91	0.60	16.00-129.00
Nonprogram	58.61	0.28	0.00-167.00
Credit Per Semester Attempted			
Program	9.06	0.05	4.45-13.75
Nonprogram	10.30	0.02	3.73-18.00
Credit Per Semester Earned			
Program	8.31	0.05	4.00-13.75
Nonprogram	9.01	0.03	0.00-14.91

Note. Values of the standard errors are given to the hundredths decimal place.

Program students attempted and earned more college level mathematics, perhaps due in large part to the high percentage of program students indicating a goal of AA degree transfer. Program students stayed approximately one semester longer than nonprogram students on average, thereby contributing to their hours earned average in a positive manner. Though nonprogram students matriculated at College A for a shorter period on average, these students attempted and earned more credits per semester.

Table 7 presents simple statistics for the independent variables and various outcome measures based on gender. Table 7 clearly shows that female students posted higher results than male students on all performance indicators, excluding the mean number of credits attempted per semester.

Table 8 presents the mean and standard errors for various outcomes measures including the student's first semester average, first year average, college math hours earned, GPA-AA, and GPA-ALL.

Despite their mathematics entry level into the college, preparatory or mainstream, the students completing the program earned more college level mathematics hours (1.31 for preparatory and 1.31 for mainstream) during their matriculation than those students who did not undergo the program experience. Program students who began their college experience taking preparatory mathematics attained a higher GPA after one semester than nonprogram students who began in the preparatory mathematics track. The difference in mean GPA was .17 for program and nonprogram students who began in the college preparatory mathematics track.

Table 7

Means and Standard Errors by Gender

	Male (N=56)		Female (N=99)	
Variable	Mean	SE	Mean	SE
Number of semesters Attended	6.32	0.06	7.09	0.03
First Semester Hours Attempted	14.38	0.04	13.26	0.02
First Semester Hours Earned	12.75	0.04	12.60	0.02
College Math Hours Attempted	7.98	0.12	9.11	0.07
College Math Hours Earned	4.66	0.09	6.02	0.05
First Year Hours Earned	24.04	0.13	25.10	0.07
First Semester Average	2.43	0.01	2.77	0.01
First Year Average	1.91	0.02	2.23	0.01
GPA-ALL	2.33	0.01	2.47	0.01
GPA-AA	2.39	0.01	2.41	0.01
Hours Earned	54.54	0.54	62.38	0.30
Credit Per Semester Attempted	10.24	0.05	9.78	0.02
Credit Per Semester Earned	8.68	0.05	8.88	0.03

Note. Values of the standard errors are given to the hundredths decimal place.

Table 8

Means, Standard Errors, and Ranges for Outcome Measures by Math Entry and Classification

	Math Entry = College Preparatory: Program, N=18, Nonprogram, N=88		
Variable	M	SE	Range
First Semester Average			
Program	2.71	0.03	1.44-3.31
Nonprogram	2.54	0.01	0.00-3.71
First Year Average			
Program	1.95	0.04	0.00-3.10
Nonprogram	1.93	0.01	0.00-3.46
College Math Earned			
Program	4.89	0.21	0.00-13.00
Nonprogram	3.58	0.05	0.00-19.00
GPA-AA			
Program	2.13	0.03	0.57-2.80
Nonprogram	2.33	0.01	0.00-4.00
GPA-ALL			
Program	2.26	0.02	1.23-2.86
Nonprogram	2.32	0.01	0.00-3.55

Table 8--continued.

Variable	M	SE	Range
Math Entry = College Level (Mainstream): Program, N=26, Nonprogram, N=23			
First Semester Average			
Program	2.73	0.02	1.20-3.94
Nonprogram	2.91	0.03	1.46-4.00
First Year Average			
Program	2.41	0.03	.43-3.70
Nonprogram	2.60	0.03	1.23-3.80
College Math Earned			
Program	9.88	0.20	0.00-23.00
Nonprogram	8.57	0.19	0.00-19.00
GPA-AA			
Program	2.47	0.02	0.86-3.19
Nonprogram	2.81	0.02	1.58-3.74
GPA-ALL			
Program	2.46	0.02	0.86-3.19
Nonprogram	2.89	0.02	2.16-3.74

First year averages for program (1.95) and nonprogram students (1.93) who began in the college preparatory track for mathematics were almost identical. Nonprogram students attained higher GPAs overall (2.32 vs. 2.26) as well as in college level course work (2.33 vs 2.13) than the program students.

For those subjects in the study who began their collegiate experience in the mainstream with respect to taking college level mathematics, averages for nonprogram students, despite the time or nature of assessment were higher: first semester, first year, college level work, or overall (2.91 vs 2.73, 2.6 vs 2.41, 2.81 vs 2.47, 2.89 vs 2.46, respectively).

Average Grade Point Averages and Hours Earned

All subjects included in the study were African American students who declared a goal of community college enrollment as either (a) AA degree, (b) AS degree, or (c) program certificate. Table 9 presents the mean grade point average and credit hours earned for all subjects in terms of the independent variables of program participation, gender, and degree objective. Program students earned more hours overall (61.90) than nonprogram students (58.61). Women attained higher GPAs overall (2.47) and in college credit coursework (2.41) than men (2.33 and 2.39, respectively). Women also earned more hours overall (62.38) than men (54.54).

Retention

In evaluating the effectiveness of an orientation course in reducing attrition and improving GPAs of community college students, Glass and Garrett (1995) found

Table 9

Mean Grade Point Average Overall (MGPA), Mean Grade Point Average College Credit Courses (MCGPA), and Credit Hours Earned for All Subjects (N=155)

	MGPA			MCGPA			Hours Earned		
Variable	M	SE	n	M	SE	n	M	SD	n
Program									
Program	2.39	0.01	44	2.33	0.01	44	61.90	0.60	44
Nonprogram	2.43	0.01	111	2.43	0.01	111	58.61	0.28	111
Gender									
Male	2.33	0.01	56	2.39	0.01	56	54.54	0.54	56
Female	2.47	0.01	99	2.41	0.01	99	62.38	0.30	99
Goal									
AA transfer	2.45	0.005	125	2.41	0.01	125	61.76	0.24	125
AS Technical	2.52	0.03	16	2.44	0.04	16	61.56	1.63	16
Certificate	2.01	0.06	14	2.31	0.06	14	37.50	2.09	14

that entrance test scores were not positively correlated with persistence or college grades. Not surprisingly, test scores tended not to be predictors of students' persistence or grades either. Glass and Garrett explained,

> It must be remembered, however, that community colleges often do not use these scores to reject applicants, but rather to place applicants in appropriate levels of beginning instruction. In fact, most community colleges call such instruments placement tests rather than entrance tests. (p. 129)

Table 10 provides the Pearson product-moment correlation analysis matrix of the entrance test scores with the success measure of college grades, GPA-ALL; additionally,

the analysis identifies the correlation between the entrance exam scores and the persistence variable of credit hours completed.

Table 10

Correlation Among Entrance Test Scores, Grade Point Average Overall (GPA-ALL), and Credit Hours Earned for All Subjects (N=155)

Variable	1	2	3	4	5
1. ACT-English	—	.50770**	.65835**	.26033**	.20591**
2. ACT-Math		—	.76201**	.29478**	.24367**
3. ACT-Composite			—	.26560**	.21731**
4. GPA-ALL				—	.61744**
5. Hours Earned					—

Note. $p < 0.01$.

Each of the entrance exam test categories (English, math, and composite) was significantly correlated with the other two areas; a student's overall GPA was significantly correlated with the hours earned. The entrance test scores appeared to be positively correlated with the grade point average overall and credit hours earned. To control for the possible influence of the test scores, both ANOVA and ANCOVA analyses were run, with the secondary covariate analyses using the ACT-Math score as a covariate. In each case, the data were first analyzed by an analysis of variance (ANOVA)

(SAS Procedures Guide, 1988), ignoring the fact that the entry level scores for the program students seemed higher on average. Due to the nonrandomness of the samples, follow-up analyses were run for each initial ANOVA table, using the ACT-Math score as a covariate. This was done to control for any unfair advantage or confounding of variables which could possibly be associated with the program students in that their entrance test scores were higher on average than those of the nonprogram students.

Tests of Hypotheses

This study sought to examine the association between student participation in a six-week precollege minority intervention program and academic performance. This section addresses the research hypotheses and discusses the significance of each based on the statistical methodology used. The level of significance for all hypotheses test is .05.

Tables 11, 13, 15, and 17 represent the ANOVA tables which examine the relationship between program participation and mathematics entry level to GPA as follows: (a) first semester GPA, (b) first year GPA, (c) GPA-All, and (c) GPA-AA. Tables 12, 14, 16, and 18 show the results of the covariate analyses. The ACT-Math score was entered as a covariate to control for the influence of the entrance exam test score in mathematics on student performance.

Null Hypothesis 1: There is no significant difference in GPA after one semester of matriculation for program and nonprogram students.

Table 11 indicates that no significant difference was observed in the first semester GPA of students who successfully completed the intervention program and those

students who did not when mathematics entry level and program classification were considered.

Table 11

Analysis of Variance for First Semester Average for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Program Classification

Source	df	SS	MSE	F
Model	3	2.807	.936	1.63
Error	151	86.487	.573	
Corrected Total	154	89.294		
Math Entry	1	1.043[a]	1.043	1.82
Classification	1	0.000[a]	0.000	0.00
Math Entry x Classification	1	0.761[a]	0.761	1.33

[a]Type III sum of squares. This asks if the particular model term explains more than random variation when added to the other terms in the model. (Type III is known as the partial sum of squares.)

Table 12 presents the ANCOVA analysis with the ACT-Math score as a covariate. The results were unchanged, with no significant difference observed in the first semester GPA of students who successfully completed the program and those students who did not. Null hypothesis 1 was not rejected at the .05 significance level.

Table 12

Analysis of Covariance for First Semester Average for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Classification with ACT-Math Score as a Covariate

Source	df	SS	MSE	F
Model	4	3.840	.960	1.69
Error	150	85.454	.570	
Corrected Total	154	89.294		
Math Entry	1	0.022[a]	0.022	.04
Classification	1	.000[a]	.000	0.00
Math Entry x Classification	1	.439[a]	.439	.77
ACT-Math Score	1	1.033[a]	1.033	1.81

[a]Type III sum of squares.

Null Hypothesis 2: There is no significant difference in GPA after one year of matriculation for program and nonprogram students.

In the total sample, Table 13 shows that math entrance level was significant in determining the first year average ($F = 11.80$, $p < .001$). Program students and nonprogram students who began in the college preparatory track for math earned practically identical first year averages--1.95 for program students, 1.93 for nonprogram students (Table 8). Nonprogram students who began mainstream in mathematics earned higher first year averages (2.60) than program students who began mainstream (2.41), but

Table 13

Analysis of Variance for First Year Average for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Classification

Source	df	SS	MSE	F
Model	3	10.993	3.660	5.07**
Error	151	109.207	.723	
Corrected Total	154	120.200		
Math Entry	1	8.531[a]	8.531	11.80***
Classification	1	.200[a]	.200	.28
Math Entry x Classification	1	.260[a]	.260	.36

[a]Type III sum of squares.
**$p < .01$. ***$p < .001$.

this difference was not significant. Table 14 presents the ANCOVA table with ACT-Math score as a covariate. The results were unchanged. Null hypothesis 2 was not rejected at the .05 significance level.

Null Hypothesis 3: There is no significant difference in overall GPA for program and nonprogram students.

In the total sample, Table 15 shows that math entrance level (F=12.30, $p = .0006$) and classification (F=4.49, $p = .0358$) were significantly related to GPA-ALL, but Table 16 reveals that only student classification remained significant when the influence of the ACT-Math score was considered as a covariate (F = 4.59, $p = .0337$). Null hypothesis 3 was rejected at the .05 significance level.

Table 14

Analysis of Covariance for First Year Average for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Classification with ACT-Math Score as a Covariate

Source	df	SS	MSE	F
Model	4	12.925	3.231	4.52**
Error	150	107.275	.715	
Corrected Total	154	120.200		
Math Entry	1	1.906[a]	1.90	2.66
Classification	1	.211[a]	.211	.29
Math Entry x Classification	1	.055[a]	.055	.08
ACT-Math Score	1	1.932[a]	1.932	2.70

[a]Type III sum of squares.
**$p < .01$.

Table 15

Analysis of Variance for GPA-ALL for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Classification

Source	df	SS	MSE	F
Model	3	6.423	2.141	6.54*
Error	151	49.419	.327	
Corrected Total	154	55.841		
Math Entry	1	4.025[a]	4.025	12.30**
Classification	1	1.468[a]	1.468	4.49*
Math Entry x Classification	1	.889[a]	.889	2.71

[a]Type III sum of squares.
*$p < .05$. **$p < .01$.

Table 16

Analysis of Covariance for GPA-ALL for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Classification with ACT-Math Score as a Covariate

Source	df	SS	MSE	F
Model	4	7.298	2.141	6.54*
Error	150	48.544	.327	
Corrected Total	154	55.841		
Math Entry	1	.922[a]	.922	2.85
Classification	1	1.487[a]	1.487	4.59*
Math Entry x Classification	1	.557[a]	.557	1.72
ACT-Math Score	1	.875[a]	.875	2.70

[a]Type III sum of squares.
*p < .05.

Table 17

Analysis of Variance for GPA-AA for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Classification

Source	df	SS	MSE	F
Model	3	5.794	1.931	4.34*
Error	151	67.123	.445	
Corrected Total	154	72.917		
Math Entry	1	4.608[a]	4.608	10.37*
Classification	1	1.468[a]	1.468	4.38*
Math Entry x Classification	1	.889[a]	.889	.27

[a]Type III sum of squares.
*p < .05.

Table 18

Analysis of Covariance for GPA-AA for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Classification with ACT-Math Score as a Covariate

Source	df	SS	MSE	F
Model	4	6.556	1.639	3.70*
Error	150	66.361	.442	
Corrected Total	154	72.917		
Math Entry	1	1.230[a]	1.230	2.78
Classification	1	1.968[a]	1.968	4.45*
Math Entry x Classification	1	.029[a]	.029	.07
ACT-Math Score	1	.762[a]	.762	1.72

[a]Type III sum of squares.
*$p < .05$.

Null Hypothesis 4: There is no significant difference in GPA in college credit course work for program and nonprogram students.

In the total sample, Table 19 shows that math entrance level and classification were significantly related ($F = 10.37$, $p < .01$; $F = 4.38$, $p < .01$, respectively) to GPA-AA. As before in the case of GPA-ALL, only student classification remained significant ($F = 4.45$, $p < .05$) when the influence of the ACT-Math score was considered as a covariate (Table 20). Null hypothesis 4 was rejected at the .05 significance level.

Null Hypothesis 5: There is no significant difference in GPA in the average number of semester hours successfully earned after one semester for program and nonprogram students.

Tables 19, 21, 23, and 25 represent the ANOVA tables which examine the relationship between program participation and mathematics entry level to hours earned as follows: (a) first semester, (b) first year hours earned, (c) hours earned overall, (d) hours earned in college credit math. Tables 20, 22, 24, and 26 show the results of the covariate analyses. The ACT-Math score was entered as a covariate to control for the influence of the entrance exam test score. Table 19 indicates that no significant difference was observed in the first semester hours earned of those students who successfully completed program and those students who did not. Null hypothesis 5 was not rejected at the .05 significance level.

Table 19

Analysis of Variance for First Semester Hours Earned for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Program Classification

Source	df	SS	MSE	F
Model	3	9.509	3.170	.67
Error	151	715.678	4.740	
Corrected Total	154	725.187		
Math Entry	1	2.504[a]	2.504	.53
Classification	1	.969[a]	.969	.20
Math Entry x Classification	1	4.564[a]	4.564	.96

[a]Type III sum of squares.

Table 20 presents the ANCOVA analysis with the ACT-Math score as a covariate. Upon introduction of the ACT-Math score as a covariate, statistical significance, although weak, was achieved ($F=2.53$, $p < .05$). While math entry level and classification continued as not significantly related to first semester hours earned, the ACT-Math score was significant ($F= 8.00$, $p < .01$). Thus, when controlling for ACT-Math score, null hypothesis 5 was rejected at the .05 significance level.

Table 20

Analysis of Covariance for First Semester Hours Earned for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Classification with ACT-Math Score as a Covariate

Source	df	SS	MSE	F
Model	4	45.759	11.440	2.53*
Error	150	679.428	4.530	
Corrected Total	154	725.187		
Math Entry	1	6.694[a]	6.694	1.48
Classification	1	1.069[a]	1.069	.24
Math Entry x Classification	1	.899[a]	.899	.20
ACT-Math Score	1	36.250[a]	36.250	8.00**

[a]Type III sum of squares.
**$p < .01$.

Null Hypothesis 6: There is no significant difference in the average number of semester hours successfully earned after one year for program and nonprogram students.

In the total sample, Table 21 shows that math entrance level was borderline significant in determining the first year hours earned ($F = 3.81$, $p = .0528$). Table 22 presents the ANCOVA table with ACT-Math score as a covariate. When recognizing the ACT-Math score as a covariate, math entry was not significant, but the ACT-Math score did reveal itself to be significantly related to the average number of hours earned in the first year ($F=5.26$, $p < .05$). Null hypothesis 6 was not rejected when the ACT-Math score was ignored. When controlling for the ACT-Math score, null hypothesis 6 was rejected.

Table 21

Analysis of Variance for First Year Hours Earned for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Classification

Source	df	SS	MSE	F
Model	3	444.799	148.266	2.77*
Error	151	8074.7105	53.475	
Corrected Total	154	8519.510		
Math Entry	1	203.737[a]	203.737	3.81
Classification	1	173.517[a]	173.517	3.24
Math Entry x Classification	1	99.964[a]	99.964	1.87

[a]Type III sum of squares.
*$p < .05$

Table 22

Analysis of Covariance for First Year Hours Earned for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Classification with ACT-Math Score as a Covariate

Source	df	SS	MSE	F
Model	4	718.575	179.644	3.45**
Error	150	7800.934	52.006	
Corrected Total	154	8519.510		
Math Entry	1	.327[a]	.327	.01
Classification	1	177.125[a]	177.125	3.41
Math Entry x Classification	1	44.322[a]	44.322	.85
ACT-Math Score	1	273.776[a]	273.776	5.26*

[a]Type III sum of squares.
*$p < .05$. **$p < .01$.

Null Hypothesis 7: There is no significant difference in the average number of semester hours successfully earned during college matriculation for program and nonprogram students.

Table 23 reveals that college math hours earned, first semester average, and first year hours earned were significantly related to overall hours successfully earned (F=35.27, F=9.40, F=14.92, $p < .01$, respectively). The ANOVA revealed no significant difference in average hours earned based upon classification. Null hypothesis 7 was not rejected at the .05 level of significance.

Table 23

Analysis of Variance for Hours Earned for All Subjects (N=155) Showing the Degree of Variation Attributable to Variables Considered in the Study

Source	df	SS	MSE	F
Model	10	79954.989	7995.499	19.50**
Error	144	59039.398	409.999	
Corrected Total	154	138994.387		
College Math Earned	1	14459.341	14459.341	35.27**
First Semester Average	1	3851.918	3851.918	9.40**
First Year Average	1	667.347	667.347	1.63
First Year Hours Earned	1	6116.687	6116.687	14.92**
First Semester Hours Earned	1	39.381	39.381	.10
Gender	1	6.292	6.292	.02
Classification	1	357.791	357.791	.87
Math Entry	1	.476	.476	0.00
ACT-English	1	.215	.215	0.00
ACT-Mathematics	1	52.64	52.64	.13

[a]Type III sum of squares.
$^{*}p < .05$. $^{**}p < .01$.

Null Hypothesis 8: There is no significant difference in the average number of semester hours successfully earned in college level mathematics for program and nonprogram students.

For all subjects, Table 24 shows that math entrance level was significantly related to the number of hours of college math earned ($F=34.98$, $p < .01$). On the average, for the

total group, program students earned more college level mathematics credit than nonprogram students, 7.84 hours for program students, and 4.61 hours for nonprogram students (Table 6); this difference of 3.23 credit hours in college level mathematics was significant ($p = .0003$, two-tailed). Null hypothesis 8 was rejected at the .05 level of significance for initial analyses.

When recognizing the ACT-Math score as a covariate, a student's math entry level was also significantly related (Table 25, $F=13.20$, $p < .01$) to the number of college hours earned in mathematics.

Table 24

Analysis of Variance for Hours Earned in College Level Mathematics for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Classification

Source	df	SS	MSE	F
Model	3	1047.092	349.031	18.24**
Error	151	2889.527	19.136	
Corrected Total	154	3936.619		
Math Entry	1	669.280[a]	669.280	34.98**
Classification	1	46.422[a]	46.422	2.43
Math Entry x Classification	1	.000[a]	.000	0.00
ACT-Math Score				

[a]Type III sum of squares.
**$p < .01$.

Table 25

Analysis of Covariance for Hours Earned in College Level Mathematics for All Subjects (N=155) Showing the Degree of Variation Attributable to Math Entry Level and Classification with ACT-Math Score as a Covariate

Source	df	SS	MSE	F
Model	4	1091.059	272.765	14.38**
Error	150	2845.560	18.970	
Corrected Total	154	3936.619		
Math Entry	1	250.460[a]	250.460	13.20**
Classification	1	45.675[a]	45.675	2.41
Math Entry x Classification	1	1.667[a]	1.667	.09
ACT-Math Score	1	43.967	43.967	2.32

[a]Type III sum of squares.
*$p < .05$. **$p < .01$.

College Level Academic Skills Test (CLAST) Performance as a Success Measure

The data in Table 26 indicate the frequency of subjects who successfully completed the College Level Academic Skills Test (CLAST) during their matriculation at College A; during the time period studied, the table shows that 27 or 61% of the total program students were successful in completing the CLAST requirement, while only 42 or 38% of the total nonprogram students were successful in completing the CLAST requirement. Overall, 69 students in the total group successfully met the CLAST requirement, while 86 of the total group subjects failed to meet all requirements of the CLAST exam.

Table 26

College Level Academic Skills Test (CLAST) Performance

	Passed All Parts of the CLAST		
Classification	Yes	No	Total
Program	27 (39.13)	17 (19.77)	44
Nonprogram	42 (60.87)	69 (80.23)	111
Total	69 (100.00)	86 (100.00)	155

Note. Values presented are frequency counts. Numbers in parentheses indicate column percentages.

Null Hypothesis 9: Given the student's classification, there is no significant difference in the proportions (for college preparatory math entry level and mainstream math entry level) of students who pass the CLAST exam for program and nonprogram students.

Table 27 presents the summary analysis of the maximum likelihood estimates for the SAS logistic procedure. Proc Logistic was used to model the probability that the dichotomous categorical response variable CLAST equaled to 1, where 1 = passed the CLAST exam, 2 = had not passed the CLAST exam. In this study, the variable CLAST was identified as a success outcome measure for which the preferred response was the value 1, passing the CLAST exam.

Table 27

Analysis of Maximum Likelihood Estimates (Logistic Procedure) Modeling CLAST Success

Variable	df	Parameter Estimate	SE	Wald Chi-square	Odds Ratio
Intercept	1	-2.0518	1.0396	3.8957*	•
Classification	1	-0.3492	0.4210	0.6879	0.705
Math Entry	1	1.8493	0.4144	19.9137***	6.355

$^{*}p < .05$. $^{***}p < .001$.

The odds of a mainstream student passing the CLAST were estimated at 6.4 times that of the college preparatory mathematics student (95% confidence interval from 2.8-14.3). If CLAST success were independent of a student's mathematics entry level, a 95% confidence interval estimate would include the plausible value 1 for the odds ratio. Thus, the confidence interval estimate indicated that math entry level was highly significant in CLAST success. Null hypothesis 9 was rejected at the .05 significance level.

Null Hypothesis 10: Given the student's mathematics entry level, there is no significant difference in the proportions of students who pass the CLAST exam for program and nonprogram students.

Given a student's mathematics entry level, the Logistic procedure (Table 27) estimated that the odds of a program student passing the CLAST were 1.4 times that of the nonprogram group; however, statistical significance was not associated with this estimate. Hence, parity was achieved in performance rates on the CLAST exam for

program and nonprogram students, given the mathematics entry level. Null hypothesis 10 was not rejected at the .05 significance level. Table 28 reexamines the Proc Logistic analysis with ACT-Math as a covariate.

Table 28

Analysis of Maximum Likelihood Estimates (Logistic Procedure) Modeling CLAST Success with ACT-Math Score as a Covariate

Variable	df	Parameter Estimate	SE	Wald Chi-square	Odds Ratio
Intercept	1	-2.19390	1.0574	4.3048*	•
Classification	1	-0.3177	0.4234	0.56528	0.728
Math Entry	1	1.1419	0.5281	4.6748*	3.133
ACT-Math	1	0.0862	0.0422	4.1684	1.090

*$p < .05$.

With the ACT-Math entrance exam as a covariate, results regarding statistical significance were unchanged. With respect to null hypothesis 10, the odds of a mainstream student passing the CLAST were 3.1 times that of the college preparatory student, when controlling for the ACT-Math score. When considering the ACT-Math score as a covariate, this null hypothesis was not rejected at the .05 significance level.

Null Hypothesis 11: There is no significant difference in the proportions of students who are retained (graduated, enrolled in good standing [GPA $\geq$ 2.0], enrolled not in good standing) for program and nonprogram African American students.

Table 29 presents data on student standing at the close of the study. Standing was coded as follows: 1--graduated; 2--enrolled in good standing (overall GPA $\geq$ 2.0); 3--enrolled, not in good standing; 4 --left in good standing (overall (GPA $\geq$ 2.0); 5- left, not in good standing (overall GPA 2.0). Codes 1, 2, and 3 represent retained students; codes 1, 2, and 4 represent successful students.

Table 29

Classification by Standing

	Standing					
Classification	1	2	3	4	5	Totals
Program	18	0	0	20	6	44
Nonprogram	32	2	0	54	23	111
Totals	50	2	0	74	29	155

Note. 1= graduated; 2=enrolled in good standing; 3=enrolled, not in good standing; 4=left in good standing; 5=left, not in good standing.

At the close of the study program, students posted the following results: 18 or 41% had graduated from College A; 20 or 45% had left in good standing; 6 or 14% of the program students were unsuccessful and had left the college not in good standing. Thus,

38 of the 44 program subjects or 86% were successful in their matriculation at College A. Identically, 38 of the 44 program subjects or 86% were retained, as no additional program students were currently enrolled, in good standing or otherwise, at the close of the study.

Results for the nonprogram students were as follows: 32 or 29% had graduated from College A; 2 or roughly 2% were still enrolled in good standing; 54 or 49% had left the college in good standing; and 23 or 21% were unsuccessful and had left the college not in good standing. Thus, 86 or 77% were successful, while 34 or 30% were retained in their matriculation at College A.

Comparison of the sample proportions for program (.86) versus nonprogram (.30) retention rates revealed statistical significance at the .05 level ($Z=6.27$, $p < .0001$, one tailed). Program students were retained at significantly higher rates than nonprogram students. Null hypothesis 11 was rejected at the .05 level of significance.

Null Hypothesis 12: There is no significant difference in the proportions of students who are successful (graduated, enrolled in good standing, left in good standing) for program and nonprogram students.

Comparison of the sample proportions for program (.86) versus nonprogram (.77) success rates revealed no significant difference ($Z= 1.25$, $p =.21$, two-tailed). Consequently, program and nonprogram students performed equally well in terms of graduation, being enrolled in good standing or having left the college in good standing at the close of the study. Null hypothesis 12 was not rejected at the .05 significance level.

Other Related Findings

Findings for Graduates and Nongraduates

Of the 155 subjects in the total study, 50 graduated of which 18 (36%) were program students and 32 (64%) were nonprogram students. When controlling for gender, 16 (32%) of the graduates were male; 34 (68%) of the graduates were female. Of the 16 males who graduated, 3 (18.75%) were program students, while 13 (81.25%) were nonprogram students. Examination of the 34 female graduates revealed that 15 (44.12%) were program students; 19(55.88%) were nonprogram students. Table 30 presents this descriptive information in a frequency table. Compared to the overall characteristics of the male students, the graduates were fairly consistent (Table 1). This result did not hold true for female graduates when compared to the overall group. Table 31 presents the frequency distribution of nongraduates by classification and gender.

Table 30

Classification by Gender for Graduates

	Gender		
Classification	Male	Female	Total
Program	3 (18.75)	15 (44.12)	18
Nonprogram	13 (81.25)	19 (55.88)	32
Total	16 (100.00)	34 (100.00)	*N* = 50

Note. Values presented are frequency counts. Numbers in parentheses indicate column percentages.

Table 31

Classification by Gender for Nongraduates

	Gender				
Classification	Male		Female		Total
Program	6	(15.00)	20	(30.77)	26
Nonprogram	34	(85.00)	45	(69.23)	79
Total	40	(100.00)	65	(100.00)	N = 105

Note. Values presented are frequency counts. Numbers in parentheses indicate column percentages.

Table 32 summarizes information on graduates using program classification and math entry status. Of the 50 graduates, 22 (44%) began their college matriculation taking remedial math, while 28 (56%) began in the mainstream for college level mathematics. Of the 18 program graduates, 3 (16.67%) of the graduates began in college preparatory math; 15 (83.33%) of these students began in college level mathematics. For the 32 nonprogram students who graduated, 19 (59.38%) began in remedial math; 13 (40.62%) began in college level mathematics. The frequency distribution of graduates based upon classification by math entry was fairly consistent with the demographics of the overall group (Table 3). Table 33 provides the corresponding frequency distribution of nongraduates for comparison. It should be noted that 84 (80%) of the 105 students who failed to graduate began in college-preparatory mathematics.

Table 32

Classification by Math Entry for Graduates

	Math Entry Level		
Classification	College Prep	College Level	Total
Program	3 (13.64)	15 (53.57)	18
Nonprogram	19 (86.36)	13 (46.43)	32
Total	22 (100.00)	28 (100.00)	N = 50

Note. Values presented are frequency counts. Numbers in parentheses indicate column percentages.

Table 33

Classification by Math Entry for Nongraduates

	Math Entry Level		
Classification	College Prep	College Level	Total
Program	15 (17.86)	11 (52.38)	26
Nonprogram	69 (82.14)	10 (47.62)	79
Total	84 (100.00)	21 (100.00)	N = 105

Note. Values presented are frequency counts. Numbers in parentheses indicate column percentages.

Of the 50 graduates, 39 (78%) declared the AA degree as their intended goal or objective of community college enrollment; 6 (12%) declared the AS degree as their goal; and 5 (10%) indicated a vocational certificate was the goal. Differences as observed were only marginal as compared to the overall group (Table 4), with the exception of those students seeking AS degrees. Table 34 shows the resulting frequency distribution for classification in relation to goal for the 50 graduates. Both of the program students from the original group who were seeking AS degrees graduated. The lone program student seeking a certificate was unsuccessful. Sixty percent (60%) of the program students who sought AA transfer degrees completed all requirements for graduation from the community college. Table 35 provides the corresponding frequency distribution of classification by goal for nongraduates. Program students represented less than twenty-five percent (24.76%) of the students who did not graduate.

Table 34

Classification by Goal for Graduates

	Goal or Objective						
Classification	AA degree		AS degree		Certificate		Total
Program	15	(38.46)	2	(33.33)	1	(33.33)	18
Nonprogram	26	(62.54)	4	(67.67)	2	(67.67)	32
Total	41	(100.00)	6	(100.00)	3	(100.00)	N =50

Note. Values presented are frequency counts. Numbers in parentheses indicate column percentages.

Table 35

Classification by Goal for Nongraduates

Classification	Goal or Objective: AA degree		AS degree		Certificate		Total
Program	25	(29.76)	0	(0.00)	1	(0.09)	26
Nonprogram	59	(70.24)	10	(100.00)	10	(99.91)	79
Total	84	(100.00)	10	(100.00)	11	(100.00)	N =105

Note. Values presented are frequency counts. Numbers in parentheses indicate column percentages.

Table 36 presents the frequency distribution for graduates based on their classification and CLAST result. In the overall group, program students represented 39.13% of those who passed the CLAST (Table 26); for graduates, program students represented 38.64%; for the entire group, program students represented 19.77% of those who failed the CLAST; for graduates, program students represented 16.67% of those who failed the CLAST. Table 37 provides the analogous frequency distribution of classification by CLAST for the nongraduates.

Table 38 provides a breakdown of the standing of those students who did not graduate by the close of the research study. Of the 105 nongraduates, the table revealed that none of the students who were not in good standing were persisters.

Table 36

Classification by CLAST for Graduates

	Satisfied Requirements and Passed All Parts of the CLAST		
Classification	Yes	No	Total
Program	17 (38.64)	1 (16.67)	18
Nonprogram	27 (61.36)	5 (83.33)	32
Total	44 (100.00)	6 (100.00)	N = 50

Note. Values presented are frequency counts. Numbers in parentheses indicate column percentages.

Table 37

Classification by CLAST for Nongraduates

	Satisfied Requirements and Passed All Parts of the CLAST		
Classification	Yes	No	Total
Program	15 (17.86)	11 (52.38)	26
Nonprogram	69 (82.14)	10 (47.62)	79
Total	84 (100.00)	21 (100.00)	N = 105

Note. Values presented are frequency counts. Numbers in parentheses indicate column percentages.

Table 38

Classification by Standing for Nongraduates

	Standing				
Classification	2	3	4	5	Total
Program	0	0	20	6	26
Nonprogram	2	0	54	23	79
Total	2	0	74	29	105

Note. 2=enrolled in good standing; 3=enrolled, not in good standing; 4=left in good standing; 5=left, not in good standing.

Using several of the variables as identified in the research study, Table 39 provides a comparative summary for the 50 graduates and 105 students who did not graduate. In terms of persistence, graduates completed (77.78) almost thirty (30) hours more than nongraduates (50.87). Grade point averages for graduates overall (2.71) and in college credit course work (2.69) were consistently higher than GPAs for nongraduates (2.28, 2.26, respectively). As preferred, graduates earned less hours on average in college preparatory math (2.84) than nongraduates (4.60) but posted greater gains in college level mathematics (8.62) than nongraduates (4.06). Graduates persisted longer (8.00 semesters) as compared to nongraduates (6.24 semesters) probably due to the fact that graduates were successfully progressing toward their goals.

Table 40 compares several outcome measures and success indicators for program students who graduated and those who did not graduate. Program students who were

Table 39

Comparison of Summary Statistics for Graduates, Nongraduates (N1=50, N2 = 105)

Variable	Mean	SE	Range
Hours Earned			
Graduate	77.78	3.28	3.00-167.00
Nongraduate	50.87	2.84	0.00-129.00
GPA-All			
Graduate	2.71	0.07	0.69-3.74
Nongraduate	2.28	0.06	0.00-3.55
GPA-AA			
Graduate	2.69	0.06	1.38-3.74
Nongraduate	2.26	0.07	0.00-4.00
Prep Math Earned			
Graduate	2.84	0.53	0.00-11.00
Nongraduate	4.60	0.35	0.00-19.00
College Math Earned			
Graduate	8.62	0.72	0.00-23.00
Nongraduate	4.06	0.42	0.00-20.00
ACT-Mathematics			
Graduate	13.70	0.99	1.00-27.00
Nongraduate	10.81	0.53	1.00-26.00
# of Semesters Attended			
Graduate	8.00	0.35	2.00-15.00
Nongraduate	6.24	0.35	2.00-19.00
First Semester Hours Earned			
Graduate	13.04	0.28	3.00-17.00
Nongraduate	12.45	0.22	0.00-18.00

Table 39--continued.

Variable	Mean	SE	Range
First Year Hours Earned			
Graduate	27.26	0.95	2.00-42.00
Nongraduate	23.50	0.73	0.00-41.00
First Semester Average			
Graduate	2.96	0.08	0.13-4.00
Nongraduate	2.66	0.07	0.00-3.94
First Year Average			
Graduate	2.78	0.08	0.06-3.80
Nongraduate	2.33	0.07	0.00-3.70
Credit Per Semester Attempted			
Graduate	10.25	0.31	4.27-14.55
Nongraduate	9.80	0.26	3.73-18.00
Credit Per Semester Earned			
Graduate	9.96	0.37	1.50-14.55
Nongraduate	8.26	0.26	0.00-14.91

Table 40

Means, Standard Errors and Ranges for Graduates (N1=50) and Nongraduates (N2=105) based upon Classification = Program

Variable	M	SE	Range
# of Semesters Attended			
Graduates	8.08	0.10	6.00-11.50
Nongraduates	7.27	0.15	2.00-15.50
College Math Attempted			
Graduates	13.78	0.31	3.00-27.00
Nongraduates	10.69	0.26	0.00-27.00
College Math Earned			
Graduates	10.67	0.27	3.00-23.00
Nongraduates	5.88	0.18	0.00-20.00
First Year Hours Earned			
Graduates	24.89	0.19	19.00-32.00
Nongraduates	23.27	0.29	0.00-38.00
First Semester Average			
Graduates	2.87	0.02	2.25-3.25
Nongraduates	2.62	0.03	1.20-3.94
First Year Average			
Graduates	2.51	0.03	1.66-3.27
Nongraduates	2.02	0.03	0.00-3.70
GPA-All			
Graduates	2.63	0.02	2.13-3.19
Nongraduates	2.22	0.02	0.86-3.14
GPA-AA			
Graduates	2.63	0.02	2.16-3.19
Nongraduates	2.13	0.02	0.57-3.10

Table 40--continued.

Variable	M	SE	Range
Credit Per Semester Attempted			
Graduates	9.42	0.10	4.88-11.75
Nongraduates	8.80	0.09	4.45-13.75
Credit Per Semester Earned			
Graduates	9.26	0.11	4.00-11.75
Nongraduates	7.65	0.09	4.45-13.75

successful and graduated stayed longer (8.08 semesters) than program students who did not graduate (7.27 semesters). Program students who graduated attempted more college math, earned more college math, maintained higher GPAs, and attempted and successfully earned more credit per semester than those program students who did not graduate.

Relationship of Independent Variables to Persistence and GPA for Graduates

Analysis of variance revealed that math entry was significantly related ($F(1, 46)= 4.48$, $p < .05$) to the GPA in college level course work (GPA-AA) for those students who graduated. This difference disappeared when the influence of the ACT-Math entrance test score was considered as a covariate.

Math entry was also significantly related ($F(1, 46) =4.32$, $p < .05$) to the overall grade point average (GPA-ALL) for students who graduated. Once again, this difference disappeared when the influence of the ACT-Math entrance test score was considered as a covariate.

For graduates, both math entry and classification were significantly related to credit per semester earned ($F(1,46)=9.60$, $p < .05$ and $F=(1,46)=8.23$,$p < .05$, respectively).

Ignoring entrance scores in math, the math entry level (preparatory or mainstream) was significantly related to the number of hours in college level math that a graduating student earned ($F(1,46)=4.21$, $p < .05$). When the influence of the ACT-Math score was considered, this difference disappeared.

Summary of Findings

At the close of the data collection for this study, 50 (32%) of the 155 study subjects had graduated. Sixteen of the graduates were male; 34 of the graduates were female, yielding percentages of 32% and 68%, respectively.

Eighteen of the total graduates were program students; 32 were nonprogram students, with percentage breakdown of 36% and 64%, respectively. Of the 50 graduates in the study, 22 (44%) began their college matriculation in college preparatory mathematics; 28 (56%) began their college matriculation in college level mathematics. At the close of the study, 1 (6%) of the 18 program graduates had not passed the CLAST exam; 5 (16%) of the 32 nonprogram graduates had not passed the CLAST exam. In Florida, these students would have encountered some difficulty progressing to upper division study in the state university system. According to Holcombe (1997),

> a student must pass all of the subtests in the CLAST to receive an AA degree. Students in the state university system who have not taken the CLAST must also pass it to receive a bachelor's degree. The passing scores were raised in 1986 and 1989. (p. 353)

On average, program graduates attended 8.08 semesters, completed 10.67 hours of college level math, maintained first semester GPAs of 2.87, maintained a first year GPA of 2.5, and maintained overall and college credit GPAs of 2.63. On average, nonprogram graduates attended 7.95 semesters, completed 7.47 hours of college level math, maintained a first semester GPA of 2.94, maintained a first year GPA of 2.63, and maintained overall and college credit GPAs of 2.76 and 2.73, respectively.

No significant difference was found in first semester GPAs (Tables 11 and 12) nor first year GPAs (Tables 13 and 14) for program and nonprogram students. Nonprogram students attained significantly higher GPAs overall, as well as in college level course work (Tables 15, 16 and Tables 17, 18, respectively). Program students earned significantly more hours of college level mathematics than did their nonprogram counterparts (Tables 24 and 25).

CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

This study compared a group of African American students who experienced precollege intervention to a comparable group of African American students who did not experience program intervention at a community college. In order to support program success and effectiveness, it was expected that program students should perform at or above the level of nonprogram students with respect to credits earned, GPA, CLAST success, and retention. Completion of a precollege minority intervention program offered at College A appeared to enhance the persistence and success rates of African American students. Program students performed at or above the level of nonprogram students on all success measures, with the exception of overall GPA and college credit GPA. In spite of lower GPAs, program students performed at comparable or higher levels than nonprogram students with respect to the CLAST exam, credit hours earned, graduation rate and student standing.

Research Hypotheses/Conclusions

Two groups of students, 44 program and 111 nonprogram, were compared in order to determine the differences between the two groups. In comparing the academic performance, retention, and success of program students with that of nonprogram

students, the following null hypotheses were examined for significance at the .05 level. The resulting inference per hypothesis is also given.

Null Hypothesis 1: There is no significant difference in GPA after one semester of matriculation for program and nonprogram students.

Statistical significance was not achieved for null hypothesis 1. The claim of no significant difference in GPA after one semester of matriculation for program and nonprogram students was not rejected at the .05 level of significance. No significant difference was observed in the first semester GPAs of students who successfully completed the precollege minority intervention program and those who did not. When controlling for the ACT-Math entrance exam score, program students and nonprogram students still achieved parity in first semester GPAs.

Null Hypothesis 2: There is no significant difference in GPA after one year of matriculation for program and nonprogram students.

Statistical significance was not achieved for null hypothesis 2. The claim of no significant difference in GPA after one year of matriculation was not rejected at the .05 level of significance. After one year of study, there was no significant difference in the GPAs for program and nonprogram students.

Null Hypothesis 3: There is no significant difference in overall GPA for program and nonprogram students.

Statistical significance was achieved for null hypothesis 3 at the .05 level of significance. The claim of no significant difference in overall GPA was rejected. Nonprogram students posted significantly higher overall GPAs than program students.

Null Hypothesis 4: There is no significant difference in GPA in college credit course work for program and nonprogram students.

Statistical significance was achieved for null hypothesis 4 at the .05 level of significance. The claim of no significant difference in GPA in college credit course work was rejected. Nonprogram students posted significantly higher GPAs in college level course work than did program students.

Null Hypothesis 5: There is no significant difference in the average number of semester hours successfully earned after one semester for program and nonprogram students.

Statistical significance was not achieved for null hypothesis 5. The claim of no significant difference in the average number of semester hours successfully earned after one semester was not rejected at the .05 level of significance. Program and nonprogram students earned approximately the same number of credit hours after one semester.

Null Hypothesis 6: There is no significant difference in the average number of semester hours successfully earned after one year for program and nonprogram students.

Statistical significance was not achieved for null hypothesis 6. The claim of no significant difference in the average number of semester hours successfully earned after one year was not rejected. Program and nonprogram students earned approximately the same number of credit hours after one year. Statistical significance was achieved for null hypothesis 6, however, when recognizing the entrance exam math score as a covariate. Results indicated that entrance scores in math had a significant effect on the number of credit hours earned after one year in college.

Null Hypothesis 7: There is no significant difference in the average number of semester hours successfully earned during college matriculation for program and nonprogram students.

Statistical significance was not achieved for null hypothesis 7. The claim of no significant difference in the average number of semester hours successfully earned during college matriculation was not rejected. Program and nonprogram students earned approximately the same number of credit hours overall during college matriculation.

Null Hypothesis 8: There is no significant difference in the average number of semester hours successfully earned in college level mathematics for program and nonprogram students.

Statistical significance was achieved for null hypothesis 8 at the .05 level of significance. The claim of no significant difference in the average number of semester hours successfully earned in college level mathematics was rejected. Program students earned significantly more hours of college level mathematics than did nonprogram students at College A. Irrespective of their mathematics entry level into the college, preparatory or mainstream, the students completing the precollege minority intervention program at College A earned significantly more college level mathematics hours during their matriculation that those students who did not undergo the program experience.

Null Hypothesis 9: There is no significant difference in the proportions (for college preparatory math entry level and mainstream math entry level) of students who pass the CLAST exam, when controlling for the student's classification as a program or nonprogram student.

Statistical significance was not achieved for null hypothesis 9. The claim of no significant difference in the proportions (for college preparatory math entry level and

mainstream math entry level) of students who pass the CLAST exam, when controlling for the student's classification, was not rejected. Program students performed as well as nonprogram students on the CLAST exam.

> Null Hypothesis 10: There is no significant difference in the proportions of students who pass the CLAST exam, when controlling for the student's math entry level, for program and nonprogram students.

Statistical significance was achieved for null hypothesis 10. The claim of no significant difference in the proportions of students who pass the CLAST exam, when controlling for the student's math entry level, was rejected. Given classification, students who began mainstream in mathematics were much more likely to have passed the CLAST exam. This result was consistent with preliminary findings reported by Kraemer (1996). Students who are good in mathematics tend to succeed in college in general.

> Null Hypothesis 11: There is no significant difference in the proportions of students the college retained (graduated, enrolled in good standing [GPA $\geq$ 2.0], enrolled not in good standing) for program and nonprogram students.

Statistical significance was achieved for null hypothesis 11 at the .05 level of significance. The claim of no significant difference in the proportions of students the college retained (graduated, enrolled in good standing [GPA $\geq$ 2.0], enrolled not in good standing) was rejected. Program students were retained (graduated, enrolled in good standing, enrolled not in good standing) at a significantly higher rate than nonprogram students.

Null Hypothesis 12: There is no significant difference in the proportions of students who are successful (graduated, enrolled in good standing, left in good standing) for program and nonprogram students.

Statistical significance was not achieved for null hypothesis 12. The claim of no significant difference in the proportions of students who were successful (graduated, enrolled in good standing, left in good standing) for program and nonprogram students was not rejected. Program students performed equally well based on success criteria (graduated, enrolled in good standing, left in good standing) as the nonprogram students.

Only six or approximately 14% of the original sample (N=44) of program students left the college, not in good standing, with a GPA ≤ 2.0. Twenty-three or roughly 21% of the original sample (N =111) of nonprogram students left the college. not in good standing, with a GPA ≤ 2.0. Although they did not graduate, 20 program students and 54 nonprogram students left the college in good standing.

Summary

Of the 12 null hypotheses considered, 6 (null hypotheses 3, 4, 6, 8, 10, and 11) were rejected at the 0.05 level of significance. A healthy skeptic might ask the following question: Given the 12 null hypotheses were each tested by univariate methods, is it plausible that the significant differences are spurious--simply the result of doing 12 statistical tests, a large number? Five of the 12 hypotheses were found significant at the .05 level of significance. By chance, the expectation would have been .6. Hence, it is not plausible that the significant differences as observed in this study were spurious.

Of the six significant tests, one (null hypothesis 6) attained significance upon recognizing the entrance math score as a covariate. Hypotheses 3, 4, and 6 identified significant differences which favored nonprogram students in the areas of overall GPA, GPA in college credit work, and average number of semester hours successfully earned after one year, when recognizing entrance exam math scores. Hypotheses 8 and 11 identified significant differences which favored students who participated in program intervention. Results indicated that program students earned significantly more hours of college level mathematics and that these students were retained at a significantly higher rate than nonprogram students. Hypothesis 10 indicated that students who were able to take college level math upon enrollment had a much higher chance of passing the CLAST exam. Hypotheses 1, 2, 5, 7, and 9 revealed that program students performed as well as nonprogram students in the areas of GPA after one semester, GPA after one year, average number of hours after one semester, average number of hours during college matriculation, and CLAST exam result.

Based on this case study, participation in a precollege minority intervention program prior to the FTIC enrollment appears to assist in preparing minority students to persist in community college enrollment and succeed in college level course work, including, but not limited to, college level mathematics. Of the success indicators utilized in this study, only GPA was lower for students who participated in the minority intervention program. However, lower GPAs did not hamper the ability of the program students to compete at or above the level of the nonprogram students in terms of CLAST performance, persistence (credit hours earned) and success (graduation rate, standing).

Recent studies and associated literature continue to highlight the importance of the role of the community college in the area of minority intervention (Duffus & Isaacs, 1992; Gillett-Karam et al., 1990-1991; Gorski, 1990-1991; Nora & Rendon, 1991; Parker, 1997; Quimbita, 1991; Riggs et al., 1990). Established minority intervention programs at community colleges and universities typically seek to enhance the persistence, retention, graduation rate, and transfer skills of minority students. Most programs integrate a special component which addresses mathematics intervention (Hayes, 1995; Mendoza & Corzo, 1996; Santa Rita & Bacote, 1996).

Recommendations for Further Research

African American students who enrolled in College A immediately after having completed a precollege minority intervention program appeared to benefit from the program. Provided similar programs in similar institutions prove instrumental in increasing African American student access, it is recommended that student and program outcomes be evaluated on a periodic basis. The findings of this study also indicate that mathematics entry level (college preparatory or mainstream) and entrance exam score in mathematics appear to be two very important factors in persistence, retention, and success for African American students. Further research is needed in the pattern of mathematics courses attempted and completed by African American students in secondary school. According to Nora and Rendon (1991), there is a significant correlation between math enrollment by race and prior course-taking patterns and achievement while in high school. Given that the typical high school curriculum which African American students complete predisposes them to failure, implementation of a college preparatory

track in mathematics would be advisable. An in-depth look at all courses prior to college entry in mathematics is advised. In summary, the following recommendations are offered:

- Investigate the precollege mathematics preparation of African American students, listing all math courses and math related activities completed from grades 7-12, with course name, content, description and student grade at time of course or activity.

- Look at the mathematics background of African American students with high mathematics aptitude as supported by college entrance examination scores in mathematics.

- Look for evidence of any gender differences in degree of math avoidance and choice of college major by African American students.

- Recommend a suitable precollege mathematics intervention program for African American students.

Finally, an in-depth analysis of the characteristics of the African American students who participated in the precollege minority intervention program at College A, but who subsequently failed to enroll at the college, may provide valuable information. It would be interesting to note whether these students enrolled elsewhere or not at all; if these students attended another college or university, an evaluation of their academic performance could contribute greatly to program assessment.

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BIOGRAPHICAL SKETCH

Ruby Evans was born August 10, 1960, in Shreveport, Louisiana, as the youngest of five children to Walter and Rosalie Jones Evans. She completed her elementary and high school education at Pineview High School in Lisbon, Louisiana. Ms. Evans began her college education in her junior year of high school, having been selected to attend Grambling State University's High Ability Program in the summer of 1976. She graduated as class valedictorian from high school in May 1977. Ms. Evans returned to Grambling State University in May 1977 as a Merit Scholar; she graduated summa cum laude with a Bachelor of Science in mathematics education in May 1981, having completed her student teaching at Southwood High School in Shreveport, Louisiana. While enrolled in undergraduate study, Ms. Evans received numerous awards and honor distinctions. One of the most notable was the 1980-81 "Award for Excellence in Teacher Education." The Department of Teacher Education at Grambling presented a plaque to Ms. Evans certifying her as the top graduate from that department.

Ms. Evans studied statistics for one year in the beautiful Ozark Mountains at the University of Arkansas, Fayetteville. She returned to Louisiana in 1982 and completed her master's degree in applied statistics from Louisiana State University in 1983.

Ms. Evans has worked full time in postsecondary education for 12 years--2 years as a professor of mathematics and statistics at Florida Community College at

Jacksonville, the remaining time being spent in her current position as professor of mathematics and statistics at Santa Fe Community College, Gainesville.

Ms. Evans exchanged marriage vows with Charles Ikechukwu Ezigbo on February 15, 1984. They have two children, Andrew Ikechukwu Ezigbo and Joseph Oraefoh Ezigbo. Charles Ikechukwu Ezigbo graduated from Grambling State University in May 1981 with a degree in mathematics and a minor in physics; studied mathematical statistics at the University of Arkansas, Fayetteville (1981-82); graduated with a master's degree in applied statistics from LSU, Baton Rouge, in December 1983; and studied mathematical statistics at the doctorate level at University of Florida, Gainesville (1984-86). Charles has been a business entrepreneur in the private sector since 1987. He owns and operates a retail tennis store in Gainesville, Florida, and also engages in international trade.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.

James L. Wattenbarger
James L. Wattenbarger, Chairperson
Distinguished Service Professor of Educational Leadership

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.

W. Max Parker
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Professor of Counselor Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.

C. Arthur Sandeen
C. Arthur Sandeen
Professor of Educational Leadership

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.

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This dissertation was submitted to the Graduate Faculty of the College of Education and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Education.

August, 1998

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